Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: ABBey 5215

Vol. XXXIV.—No. 10 October, 1941 PRICE NINEPENCE Subscription 10/6 per annum, post free

Principal Contents:

PAGE

Editorial Notes 141

Notes and News 142

Light and Lighting—
A Forward Outlook 144

Problems in
A.R.P. Lighting 147

"Whiteness"—
Its Meaning
and Measurement 152

Lighting Literature 154

Where to Buy 155

Looking Ahead

IN his Presidential Address, at the opening meeting of the new I.E.S. Session (see p.144), Mr. W. J. Jones briefly reviewed progress in illumination. He drew attention to the increasing consumption of electricity for lighting which now approximates to 5,400 million units per annum, to the need for standardisation of types of lamps and voltage to developments in fluorescent lamps and to architectural lighting.

But to the members present his forecast of the future of the Society, with centres in all the chief towns and cities and a membership of at least 2,000, was specially stimulating. The work now being initiated in connection with the part to be played by lighting in reconstruction should ultimately do much to enhance the Society's reputation and attract further adherents.

An important departure, successfully negotiated, has been the creation of Fellowship. But we were glad to note the President's reminder that this distinction, whilst granted as a recognition of specified technical qualifications, does not operate as a condition of membership—for the Society remains open to all interested in its aims and objects.

In this connection Mr. Jones emphasised the broad basis on which the Society is built, its need for the aid of experts in other professions, and the fact that in illuminating engineering "the human element" is of outstanding importance.

I.E.S. Meetings

Circulation of Notices

In the last issue of the I.E.S. Transactions (Sept., 1941, p. 115) a full list of forthcoming meetings, in London and elsewhere, was published. There is a good prospect that the number will be quite as great, if not greater, than in last session. For some little time, however, it has been evident that, in present circumstances, the great majority of members are rarely able to attend meetings at a distance, and accordingly the method of issuing printed notices of meetings has been under consideration. It has now been decided by the Council that in the ordinary course printed cards of admission will only be circulated amongst the members of the area concerned—e.g., only members resident in London and its vicinity will receive cards for general meetings in London, though, of course, any others who can attend will be welcome. The same procedure will be followed by the various Centres and Groups. Efforts will be made, however, to print announcements of forthcoming meetings in the Transactions and this journal. In addition, notices will be sent to any member who specially desires to receive intimations of meetings at a distance if he applies to the honorary secretary in London, or to the secretary of the particular group or centre concerned, asking for his name to be placed on the regular postal list.

Continuation of the Black-Out

In the House of Commons on October 9 Mr. Herbert Morrison, Home Secretary, announced that there would be no relaxation of the black-out. He stated that increased lighting of the streets would cause alarm and disquiet amidst the general public, who would prefer the admitted inconveniences of the black-out, besides the danger of providing the enemy with a ready-made map of the area lighted. Arrangements to extinguish lights on receipt of a warning would involve a considerable amount of electrical work which could not be readily executed under present conditions, besides being likely to lead to accidents when the lights had been suddenly extinguished. Moreover, such a method of control system assumed that a warning could always be given, but the air-raid warning system was not automatic and depended on many human and other uncertain factors. The authorities were, however, keeping an alert mind on the subject and were ready to adapt their policy to meet the situation as it exists. Certain relaxations of the lighting restrictions, including "star" street lighting and the additional motor headlamp, had already been authorised, but it would not be in the national interest that details of all such relaxations should be given.

Road Accidents During Two Years of War

Since the article on this subject in our last issue (September, 1941, p. 127) some further data in regard to fatal accidents on the roads have been issued, enabling a complete picture of conditions during two years of war to be presented. Through the courtesy of the Royal Society for the Prevention of Accidents we are able to make available to readers the following summary:—

PARTICULARS OF FATAL ROAD ACCIDENTS.

Sept., 1939, to Aug., 1940.	Daylight.	Darkness.	Total.
Adult Pedestrians	916	3,178	4,094
Other Road Users	2,938	1,326	4,264
Total fatalities	3,854	4,504	8,358
Sept., 1940, to Aug., 1941.			
Adult Pedestrians	1,388	2,666	4,054
Other Road Users	4,384	1,636	6,020
Total fatalities	5,772	4,302	10,074

If we compare the records for the two years it is seen that whilst the number of accidents in darkness remains about the same the number in daylight has advanced considerably. But there is at least one contributory factor here—the "double daylight saving," introduced for the first time this year. This factor no doubt goes far towards explaining the changes in the night/day ratios of accidents. But the outstanding element in these figures—the remarkable reversal of the ratios for pedestrians and other road users—remains. During 1939 to 1940 the ratio of accidents occurring at night to those occurring during the day was more than *three to one* in the case of pedestrians, but more than *one to two* in the case of other road users. Even during 1940 to 1941 *twice* as many pedestrians were killed at night as during the day—in spite of the fact that the majority of people walk the roads at night as seldom as possible. On the other hand, the number of fatalities to "other road users" during the night was only about a *third* of those who suffered during the day.

To our mind the conclusion is irresistible. The only possible explanation is that pedestrians, unlike "other road users," do not carry lights, which serve the double purpose of enabling drivers to see objects on the road and of revealing their approach to other road users. In the circumstances it appears ridiculous to affirm, in the words of *The Times*, that "the black-out is not to blame, except indirectly. . . ." In order to diminish the night accidents to pedestrians, nearly half the total for the year, two possible measures are indicated—to provide somewhat better street lighting so that pedestrians as well as motorists can see, and/or to insist on pedestrians carrying if not a light at least some white garment or object of substantial size so that they can themselves be seen.

PHOTO: COURTESY B.T.H. CO. LTD.

VITREOSIL *in* FACTORY LIGHTING

Improvements in factory lighting have been accelerated by the war. One of the newest developments in lighting, the super-pressure Mercury Vapour burner, has only been made possible by reason of the well-known heat resistance of fused silica. Transparent VITREOSIL, pure fused silica, has been manufactured for over 30 years and is used in these new lamps of high efficiency.

Sole Manufacturers:

THE LTD.

THERMAL SYNDICATE

Head Office and Works: Wallsend, Northumberland.
London Depot: 12-14, Old Pye Street, Westminster, S.W.1.

Forthcoming I.E.S. Meetings

Nov. 11th. Mr. H. C. Weston on **Industrial Lighting in Reconstruction.** *(Sessional Meeting to be held in the Lecture Theatre of the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.)* **2.30 p.m.**

Nov. 6th. Dr. J. H. Saxby on **The Physiological Aspects of Lighting.** *(Meeting of I.E.S. South Wales Group, in the Lecture Theatre of the Medical School, University College, Newport-street, Cardiff.)* **3.30 p.m.**

Nov. 10th. Dr. W. M. Hampton on **The Manufacture of Glass.** *(Meeting of I.E.S. North Midland Centre, at the Great Northern Station Hotel, Leeds.)* **3 p.m.**

Nov. 13th. A series of **Short Papers on Lighting Problems, etc.** *(Meeting of I.E.S. North Western Centre, at the Manchester School of Technology, Sackville-street, Manchester.)* **2.30 p.m.**

Obituary

DR. JAMES KERR

We learn, with deep regret, of the recent death of Dr. James Kerr, formerly Medical Officer (Education) of the London County Council, and one of the earliest members of the Illuminating Engineering Society. Dr. Kerr was much in advance of his times in the keen interest which he took in illumination in relation to vision and hygiene. He served on the Council and took an active part in the Society's meetings. He was the author of a paper on the Natural Lighting of Schools, presented in 1911, and acted as chairman of the joint committee formed by the Society to deal with school lighting, which reported in 1913 and 1914. Although since his retirement and removal to Edinburgh members had few opportunities of meeting Dr. Kerr, there are many who will remember his genial and sagacious personality. He was typical of the class of independent expert, with a distinctive and impartial point of view, whose services are so valuable in connection with illuminating engineering.

Ferranti 'Starlight'

IMPROVED

STREET LIGHTING UNIT

★ Simplest to clean and re-lamp.

★ Standardised for 15 and 25 watt lamps in 15 foot and 20 foot mountings. 15 watt only for 10 foot mounting.

★ No tools required; simply undo the captive thumb-screw.

★ No loose parts; no perforated metal or gauze to choke with dust.

★ Standard Units made suitable for various forms of connectors required for different fittings.

★ Ample space around lamp to prevent excessive temperature rise and premature burnouts.

Please write for Leaflet SL.40.

FERRANTI LTD., Moston, Manchester, 10

London Office: Bush House, Aldwych, W.C.2

Light and Lighting

A Forward Outlook

By W. J. JONES, M.Sc., M.I.E.E. (Fellow)

In what follows we give an account of the proceedings at the Opening Sessional I.E.S. Meeting on October 14, when the Presidential Address was delivered by Mr. W. J. Jones.

There was a good attendance at the opening meeting of the Illuminating Engineering Society on October 14, when Mr. W. J. Jones delivered his presidential address.

The new President was introduced by Professor J. T. MacGregor-Morris, to whose services as President during the past year a tribute was paid and acclaimed by members present. Subsequently Mr. J. G. Holmes came forward to receive the Leon Gaster Memorial Premium, awarded for his paper on "The Recognition of Coloured Light Signals."

In opening his address Mr. Jones recalled that the Society, in its conception of activities, did not consider itself to be a "Society of Illuminating Engineers," and included in its scope other subjects besides illuminating engineering proper. The technical requirements of lighting formed part of a general background. Conditions associated with the war had led us to attach increased importance to the impressions received by the eye, the effect of brightness contrast in giving form to objects and the psychological effects of lighting. The Society had always enjoyed the support of men in widely different aspects of branches of art and science. Greater efforts should be made to enlist the support of such experts, especially those concerned with health and the preservation of eyesight. It is also well to remember the importance of co-operation of those concerned as users of light.

The Human Element.

In this connection the President remarked that the "human element" plays a much greater part in illuminating engineering than in some other fields of engineering. The untechnical man-in-the-street would be going beyond his knowledge if he insisted on specifying the nature of a gas engine or an electric motor, or its performance. But he may well hold quite definite views in regard to lighting fittings, which if sometimes imperfectly expressed, may be found to have a solid basis of reason behind them. We have also to recognise and bear with the human element in appraising the value of good lighting, for on the education of the public (especially those responsible for expenditure on lighting) to appreciate this value depends our success.

Apart from this we must recognise that there is much to be learned from the special view point of the user of light, who may not know much about the technicalities of lighting, but probably understands what he desires this light to accomplish. The recognition of this fact is quite consistent with a high regard for expert knowledge on lighting problems.

It is also necessary to relate theory to practical experience—as was illustrated by several experiences relating to the life of lamps.

Electric Lamps.

Turning next to electric lamps, Mr. Jones recalled that in 1922 only 1.3 millions of premises in this country were connected to electricity supply mains. In 1939 the position had changed remarkably, so that some 8 million out of a total of 12 million premises were already lighted electrically, and the consumption of electric lamps per capita during the same period increased from 0.42 to 1.75 lamps per capita per annum. It may be wondered why lamps per capita have any significance? Taken with the fact that the average wattage of lamps used in this country (70 watts) is higher than elsewhere (save the U.S.A. and South Africa (73.5 watts)), it appears that consumption of electricity for electric lighting per capita has increased over 400 per cent. in this period. This is accounted for by the increased number of lighting points throughout the country, larger lamps, and, equally important, more extended hours use per annum. The estimated present consumption of electricity for lighting purposes in this country approximates 5,400 million units per annum.

Voltage Standardisation.

Lack of standardisation of voltage is still a difficulty. At present 87 per cent. of lamps are sold for voltages between 170 and 260. The President exhibited a diagram showing the gravitation towards 230 volts and the diminution in demand for lamps taking 200-220 volts. But there was evidence of an actual rise in the percentage of lamps for 240-250 volts. The Society should lend its full support to change-over plans making 230 volts the only standard voltage in this country.

Efforts towards standardisation are also needed as regards types of lamps. Makers were formerly asked to supply 1,300 different types of projector lamps, though they have now been forced by the national emergency to accept fewer types. The tendency towards variety in types of automobile lamps has also been very marked.

Fluorescent Lamps.

The United States led the way in 1938 in the production of fluorescent tube lamps, which took the form of 15-watt 18-in. lamps of white and various colours, and the outbreak of war found British lamp-makers ready to embark on the development of this form of lamp. As it was known that lamps approximately 5 ft. long had an inherently greater efficiency compared with the smaller types, British manufacturers started by introducing 5-ft. 80-watt fluorescent lamps. This would appear to have been a wise decision, as American practice is gravitating towards the use of longer lamps, especially due to their present preoccupation on output from factories.

After the war the field available will be much wider, and modifications of the existing standard lamps, adapted to decorative display and other special purposes, will be available. They will sweep the board for lighting showcases in shops. Amongst other developments which may be foreseen are the introduction of a range of units in different sizes, down to quite small types, and affording coloured light in remarkable variety. The low brightness of these lamps will encourage their introduction into lighting schemes as decorative objects—indeed, the boundary between the functions of decoration and furnishing illumination may well become much less defined than at present.

With fluorescent lighting, levels of 20 and 30 ft.c. will be commonplace in offices and shops, while for industrial work illumination of 40, 50 and even 100 ft.c. will be an everyday occurrence.

Experience of these new lamps will inspire new designs of fittings and new lighting technique.

Mr. Jones stated that in regard to higher levels of illumination his experience was in accord with that of Mr. Ward Harrison. Fluorescent lighting makes it possible for eyes to use effectively artificial lighting levels which begin to approximate those of daylight itself. This is not generally true of filament lighting after 40-50 ft.c. are passed.

[In the course of his address Mr. Jones illustrated this view by switching on a considerable number of overhead fluorescent lamps yielding an illumination of 40 ft.c., rising to 100 ft.c. in the front of the lecture theatre.]

The ideal lighting installation is probably one

THE BTH LIGHT-CONDITIONING CODE

1. Regard the problem from the workers' point of view rather than from that of the casual observer
2. Eliminate glitter from the work and glitter and dazzle from the local field of view
3. Provide adequate illumination
4. Eliminate dazzle or glitter from the general surroundings
5. Provide reasonable brightness of walls, ceilings or other surroundings
6. Take into account the purely psychological factors by promoting cheerful, comfortable and safe working conditions
7. Employ full engineering and designing skill to keep installation and maintenance costs at lowest level consistent with the best lighting results

The seven points of the B T H Light-Conditioning Code have been framed with the object of enhancing the welfare and comfort of the worker. Factories lighted the B T H way are cheerful places in which all tasks can be easily performed with minimum fatigue and risk of accident. Only in such places can production be fully and safely maintained. With women so widely engaged in industry, good lighting—with all that it means—is of paramount importance. Welfare superintendents will find the B T H Light-Conditioning Code a helpful guide.

B T H Lighting Engineers will be pleased to advise without charge on the lighting of any factory in which special welfare problems are involved.

M. 3921

MAZDA **FLUORESCENT** Lamps with MAZDALUX Equipment
Five feet of purest daylight

BTH for all Electrical Plant and Equipment

THE BRITISH THOMSON-HOUSTON CO., LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2

which permits light to be varied in intensity, a colour change to suit all moods and conditions, and last, but not least, the use of a light source which may be moved where it is wanted without let or hindrance.

Recent lamp developments have gone far in these directions—at a touch of a switch more or less light may be obtained, while the fluorescent lamp opens up possibilities of colour variation.

Flexibility of the installation to enable the position of light sources to be changed without the inconvenience of flexible wires is still a problem worthy of concentrated consideration of the installation section of the lighting industry. Even its partial solution may involve radical changes in building details, and in any event requires the joint efforts of architects, builders, and the lighting industry.

Architectural Lighting.

Although early experiments in architectural lighting or "light architecture" were somewhat crude and of fugitive interest the fundamental principles are sound. The day is not far distant when architects may be expected to define the brightness contrast they expect, as well as the general brightness level—which can be shown on the architect's wash drawing. The illuminating engineer has occasionally been criticised by artists and architects for attaching undue importance to tools and implements. It has been argued that a lighting scheme would no more be judged in terms of foot-candles than a picture is assessed by the quality or quantity of paint used. It is true that the ultimate test of the success of a lighting installation is necessarily based on an appeal to the eye, but calculations of foot-candles and brightness are the essential steps on which a pleasing visual impression is produced. Moreover—if one may pursue the analogy—the great artists of the past were by no means indifferent to their tools. The old masters paid scrupulous attention to their paints, brushes, and canvas, uniting craftsmanship with artistic perception.

Services of the Lighting Industry.

The President then passed on to the services rendered by the lighting industry, of which he gave examples. The great value of the work of the well-equipped laboratories of the gas and electric lighting industry is now accepted. Much of the research work conducted therein is published for the general benefit. Another development has been the steady growth of educational materials issued by the lighting industry, of which the textbook, "Modern Factory Lighting," is quoted as an example. When the lighting industry is free to tell of its efforts during war time it will be found that its record of achievement is second to none.

Contribution to War Effort.

Mr. Jones next recalled the Society's work in assisting the Ministry of Home Security to deal with lighting problems associated with Civil Defence. Of outstanding importance has been the development of standard war-time street lighting. But the joint committee under the chairmanship of Mr. Percy Good has examined and reported upon a very large number of problems, such as the behaviour of the eyes at very weak illumination, devised new measuring apparatus (gauges) checking illumination equivalent to weak starlight, have designed new fittings, signs, etc., for use in these dim conditions.

Post-war Reconstruction.

The Government interest in lighting matters during recent years culminated in February last by the Ministry of Labour making mandatory requirements for lighting in factories and workshops. Many of us believe that this step taken by the Ministry of Labour and National Service is but the forerunner of similar legislation covering other walks in life.

It seems inconceivable that this country will be content to leave workers of any kind to work under unsuitable lighting conditions, and it would be folly in post-war reconstruction to perpetuate the bad lighting of pre-war days.

In other words, planning must enter into lighting for all purposes, and the Society through its Reconstruction Committee will be playing a very full part in influencing Government and public opinion. Planning for lighting must consider the requirements of the future as well as the immediate present, so that in any installation its expansion or its modification will be a matter of relative simplicity. Already the Society's Reconstruction Committee, under the chairmanship of Mr. R. O. Ackerley, has set up sub-committees to deal with such problems as the lighting of streets and outdoor areas, schools and public buildings, offices and factories, etc., and has instituted an inquiry into existing laws and regulations bearing on illumination. One task before the Committee will be the preparation of a series of brief pamphlets setting out our aims in connection with these various reconstruction problems.

Expansion of the Society.

In the final portion of his address Mr. Jones reviewed the present position of the Society and its future. He pointed out that its membership, originally eighty, now approached 1,000, that in 1938 it organised no fewer than sixty meetings, and that even under war conditions about half this number had been held. An outstanding development had been the progress of the Centres. There were now in operation five fully recognised centres, and in course of time it was hoped to see centres in operation in all the chief towns and cities throughout the country. Where only a small nucleus of members existed "groups" are being formed. One was in full operation in South Wales. Another was in course of formation in the North-East, and yet another was in prospect in the West of England. The Society should aim at bringing its membership up to the 2,000 mark. In the meantime there were several remarkable and encouraging facts. The Society's membership, in spite of war conditions, had been fully maintained, and its income had increased. And it had successfully negotiated the delicate and difficult operation of founding the distinction of Fellowship, not as a condition of membership—for the Society remains open to all interested in its aims and objects—but as a recognition of those of its members who give evidence of specified technical qualifications.

Developments Overseas.

In conclusion the President recalled the visit of Mr. Percy Good, when President, to Australia and New Zealand. We in this country watched with sympathetic interest the progress of the sister societies and the home movement towards a federal union of the three bodies now established in Australia. He also recalled his own visits to the United States when he had opportunities of appreciating the enterprise of their Societty and the great resources of their lighting industry. Under war conditions intercourse was naturally difficult, but many treasured expressions of sympathy, affection, and goodwill had been received, and it was hoped that ultimately more intimate relations would be established between all the illuminating engineering societies in the old world and the new.

Lighting in War Time

A lecture on "Lighting in War Time" will be given by Mr. J. S. Dow in the House of the Royal Society of Arts, 6, John Adam-street, Adelphi, London, W.C.2, at **1.45 p.m.** on **Wednesday, November 19.** Members of the Illuminating Engineering Society who desire to attend will be welcome, and should apply for tickets to the Royal Society of Arts. Mr. Percy Good will preside.

Problems in A.R.P. Lighting

by E. W. MURRAY

In what follows we give a summary of a very informative address delivered by Mr. E. W. Murray before the Midland I.E.S. Centre on May 23. This forms a very useful supplement to the analysis of Outdoor Lighting Problems in War Time which appeared in our last issue (September, 1941, p. 128).

It must be appreciated that the matters discussed in this paper are only the author's interpretations of some of the ways in which the "Restrictions on Lighting Order" may be met, and they must not be considered as representing "legal definitions."

General.

The Restrictions on Lighting Order states in so many words that it shall not be lawful for any light inside a building to be visible from the outside In reality this makes it an easy matter for the police to deal with any blackout variations as regards internal lighting. Incidentally, at the commencement of the war many factories reduced their internal illumination because the blackout shutters or screens were unable to produce the condition of blackout required by the law. These conditions of poor internal illumination resulted in a decrease in output with an increase in the accident risks. The inevitable result was that factories had to improve their blackout in order to improve the lighting, and in the recent Order known as "The Factories (Standards of Lighting) Regulations" a standard of lighting for certain factories is prescribed and is now in force. Therefore there is no reason to deal further with internal lighting in this address, because such lighting must be roughly up to normal lighting practice as for peace time.

Accidents in the Blackout.

In order to avoid accidents from falls, etc., it is important to allow the eyes to become either dark or light adapted gradually, because it must be remembered that the skill and experience of every worker is of the utmost importance in the successful prosecution of the war, so that everything possible must be done to reduce the risks of accident.

The question now arises as to how best to deal with the problem of the entry and exit of workpeople employed in factories. Wherever possible the illumination should be "graded" to a low level near the door. Alternatively, the workpeople should be encouraged to wait a few minutes in a dim illumination before proceeding to the open or towards the normally illuminated part of the factory. A method in use in some factories is to instal on separate circuits A.R.P. lighting, giving between 0.3 and 0.6 ft.c. on the floor, and these circuits are switched on and the normal lighting off when the people are leaving during blackout. Another method is to dim the normal illumination by lowering and afterwards raising the pressure gradually over a period of some five or six minutes. This scheme is useful where change-over in shift work is employed.

Light Locks.

Before leaving this section some reference may well be made to the subject of light locks at doorways. The B.S.I. Specification BS/ARP.15 gives some valuable information as to alternative types and devices, but there are still many instances where these light locks should be installed. Automatic switches which turn off lights near doorways when the door is opened may also play a useful part.

Complementary Lighting.

Quite a lot has been said recently on the subject of complementary lighting: that is the combination of light sources of some distinctive colour (e.g., yellow) with windows tinted in the complementary colour (e.g., blue) so as to prevent any visible light escaping outwards. It is not proposed to do more than to mention certain drawbacks, such as the depressing effects of the colour of the light under artificial illumination and the poor and cold illumination during daytime. The use of colour-sprayed lamps in this connection requires careful maintenance to ensure that the wavelength of the light emitted does not undergo alteration.

Glare in the Blackout.

It has been found from experience that the subject of glare does not receive sufficient attention. Some stimulation has been given to this subject by the Factories (Standards of Lighting) Order, in which it is required that illuminants placed below 16 ft. from the floor must be so shielded that the brightness of the illuminant cannot be seen within an angle of 20 deg. measured from a horizontal plane at eye level. This requirement relates to internal illumination, where the contrast between the light source and surroundings is not high. In black-out conditions, even with the low orders of illumination allowed for external lighting, this angle is considered by the author to be too small, because the contrast between the light source and surroundings is so very high. It is suggested that this cut-off angle should be at least 30 deg. or 35 deg. This would necessitate more light points at closer intervals, but the absence of trouble due to glare resulting in a much improved visibility would be well worth the expense and trouble.

In some measure glare troubles are existent in many installations of A.R.P. lighting. The principles to be used to reduce the glare problem are both familiar and simple—reduce the area seen by the eye if the brightness cannot be changed or reduce the brightness if the area seen by the eye cannot be changed—and if neither of these methods can be employed place the offending light source out of the more direct line of vision.

There is also the problem of the obscuration in industrial processes involving the emission of flames, sparks, or glare; but this is not, strictly, an illuminating engineer's problem.

Lighting of Obstructions.

In connection with the lighting of obstructions, etc., a word might be said regarding the use of hurrican lamps, or, perhaps one might say, the misuse of them. Sometimes these lamps are insufficiently screened to prevent light being thrown above the horizontal. Further, where screening cans are used the St. Andrew's Cross in the can, more often than not, is an inch or two above the centre of the flame, so that these devices definitely give light above the horizontal.

Some experiments were made on hurricane lamps by placing a metal collar about 1⅜ in. high and 2 in. in diameter on the bottom grid of the burner and the red glass blacked out from the top to 1½ in. of the bottom. This arrangement reduced the brightness seen above the horizontal from 100 e.f.c. to just under 1 e.f.c., and although the latter figure is still ten times the brightness allowed for signs in BS/ARP.32, the area of the illuminant is small. (Fig. 1.)

Street Lighting

Street lighting using fittings complying with the requirements of BS/ARP.37 as to illumination and

spacing and marked accordingly may be used to light any road except in special areas which may be specified by the Ministry of Home Security. They may also be used on private roadways so long as the spacing between the fittings on the private roadway—and also between these fittings and those in the public roadway—is not less than that specified in BS/ARP.37. These fittings are designed to provide an illumination of approximately 0.0002 ft.c. at ground level.

Street lighting fittings installed near buildings often provide what is thought to be a high illumination on vertical walls, parts of which are sometimes light in colour or even have a shiny surface, but the provision of cut-off screens prevents such "side splashing." Again, where "starlight" fittings are installed above or very near a roofed building the illumination on the roofs may be quite high. Specular reflection from these roofs may be appreciable if they consist of slates or other material moistened by rain or dew, and some method of screening may be advisable if the lamps cannot be removed to a more suitable position. The psychological effect of the illumination on to buildings from these or other exempted lights must be considered. Its existence often gives grave concern to the occupants, and it is often much easier to endeavour to relieve the strain by screening or camouflaging the effects than to argue that the illumination is too low to be of use to aircraft! A simple method of dealing with flat roofs is to cover them with a few inches of earth or clinker. This surface can always be broken up when it gets hard through weathering and where it may be thought to be troublesome through specular reflection from rain. The roof should be strong enough, however, to take this extra load.

Headlamps.

A few words about masked headlamps may not be out of place here. Too often it is found that large headlamps using 36-watt bulbs are fitted with a "lid" through which about half the total light flux is allowed to pass out through the mask. It is obvious, therefore, that a smaller reflector, the diameter of which should be roughly equal to the diagonal of the mask, fitted inside the large headlamp mask casing would enable a smaller lamp to be used. The resultant saving in petrol would be most useful, to say nothing of the reduction in wear-and-tear of new batteries.

Shops, Stalls, Hotels, and Places of Public Entertainment.

The whole of this Section of the Order has been cancelled, with the exception of paragraph 40 which allows the use of illuminated signs. Such illuminated signs are restricted in size to an area of 3 ft. in width and 2 ft. in height, and the aggregate area of the illuminated letters must not exceed 144 square inches. The brightness of the letters must not exceed 0.02 e.f.c., and to prevent any large illuminated area being used these signs must be inconspicuous at a distance of 100 ft. No light must be visible otherwise than from the illuminated letters or symbols, and the sign must be placed within a window or doorway on the ground floor. Signs must only be used when the premises are open to the public.

[In this connection the lecturer showed a portable brightness gauge and made reference to BS/ARP.52, in which a simple portable standard of brightness is described.]

External Lighting.

The chief officer of police for any locality is empowered to permit certain low orders of external illumination to be used where and while essential work is in progress, and unless the factory is in some specified area an exemption is usually granted, under certain conditions. Some of these conditions may be that (a) a telephone is manned not only for all the time the lighting is being used, but throughout day and night, (b) the control cock or switch controlling the lights is adjacent to the telephone, (c) the lights are extinguished on the receipt of a "purple" or perhaps a "spotters" warning, (d) or for any other reasons specified by the chief officer of police.

Yard Lighting.

The adaptation of some types of peace-time lighting fittings to conform to the Lighting Restrictions Order, particularly those of the shallow variety, often proves more costly than the provision of proper A.R.P. fittings. Such fittings are often nothing more than a rain shield for the lamps, and frequently, even with lower wattage lamps than those used before the war, light can be thrown above the horizontal. The effect of wind in swinging such fittings must be kept in mind.

It is often necessary to survey the sites of any proposed exempted lighting scheme in order to ensure, amongst other things, that the lighting points are not too near buildings. If the work warrants 0.2 ft.c. illumination on the ground, the illumination on nearby buildings might be quite high. In much the same way external lighting above glazing for the dual purpose of lighting through the glass and illuminating a yard must be discouraged. A "watch" must also be kept to ensure that any newly constructed buildings are not erected too near existing lamp standards without adequate screens.

Control of Illuminated Areas.

In general all external illumination should be limited to the area where the various classes of work are to be carried out. Figs. 2 and 3 show some of the methods employed to confine the area to be illuminated. Some of the methods shown are also suitable for use in docks or for other waterside use in reducing reflection from the surface of the water.

Returning to the question of glare, the reduction in brightness by using blue or daylight lamps in place of ordinary pearl or clear lamps has some small advantage, but this is outweighed by the reduction in contrast on the work. It has been stated many times that the illuminating engineer should be really a contrast engineer. This means that he should aim at controlling the contrast—providing sufficient contrast for optimum conditions of visibility, but at the same time ensuring that there is insufficient contrast to cause glare. Weak white light will therefore produce contrasts of black and white, while blue light will produce contrasts of blue and black, and consequently this results in a reduction in the case of "seeing." Further it has been stated that weak blue illuminated surfaces are more easily perceptible in darkness from aircraft than other coloured surfaces having equal illumination.

Wherever high contrast is necessary, however, every attempt should be made to confine the glare so produced to the minimum area over which visibility is desirable. The number or letter indicator enables such a contrast to be demonstrated easily, and this method ensures a more permanent control of the illumination than scraping some of the colour-sprayed surface off the lamps. Very effective use can be made of these signs at cinema or theatre pay boxes and the like, particularly as they can be well screened to prevent light reaching the pathway in the street. In addition they cause very little trouble from glare to patrons coming in during black-out, and even during daylight the figures are easily distinguishable. The application of screens as is used for controlling certain lighting for stage effects provides an easy method of enabling the indicated letters or numbers to be seen only within some controlled direction. The arrangements consist of two metal plates or other suitable opaque material spaced about $\frac{3}{8}$ in. to $\frac{1}{2}$ in.

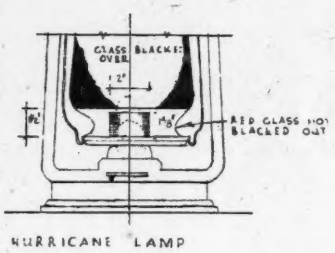
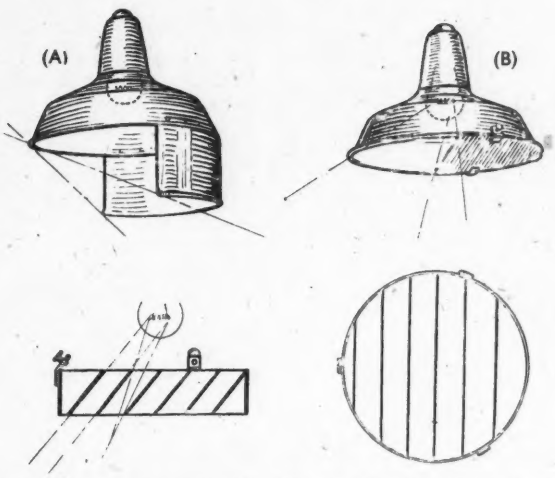


Fig. 1. Hurricane lamp equipped with metal collar in order to reduce brightness and to prevent the emission of light above the horizontal.



(a). This method is open to objection as some light is emitted above the horizontal.

(b). This method involving the use of a semi-circular plate blocking the light is much more satisfactory.

Fig. 2. Types of end screens for exterior lights.

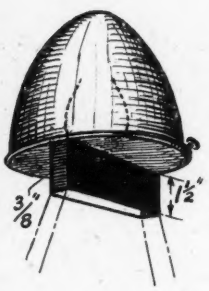


Fig. 4. Method of confining illumination for flights of stairs.

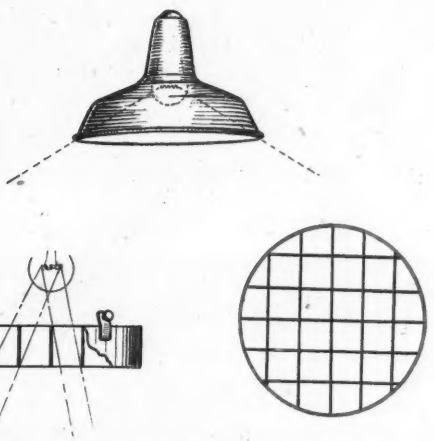


Fig. 3. Another method of confining light within the area to be illuminated.

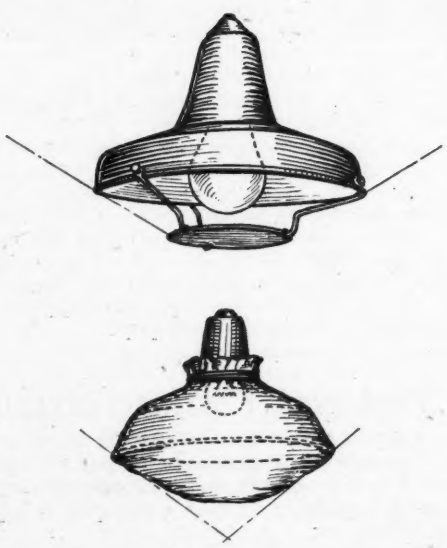


Fig. 5. These methods are unsatisfactory because light is thrown above the horizontal.

Examples of special devices used in screening sources of light during the black-out

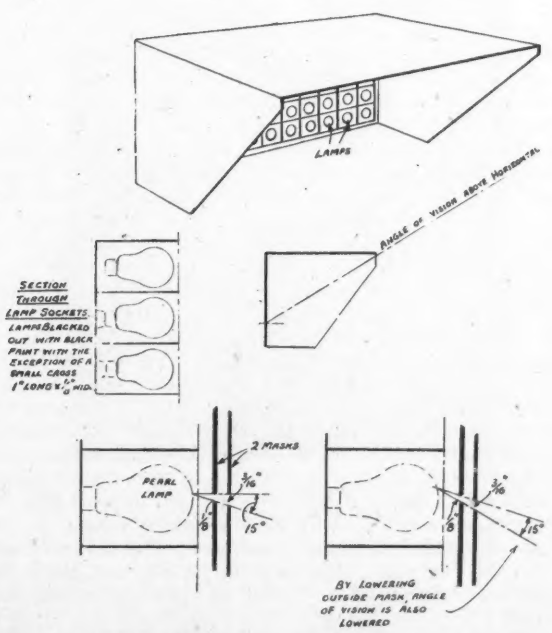

LAMPS
ANGLE OF VISION ABOVE HORIZONTAL
SECTION THROUGH LAMP SOCKETS
LAMPS BLACKED OUT WITH BLACK PAINT WITH THE EXCEPTION OF A SPIRAL CROSS 1" LONG x ⅛" WID.
2 MASKS
PEARL LAMP
3/16"
⅛"
15°
BY LOWERING OUTSIDE MASK ANGLE OF VISION IS ALSO LOWERED

Fig. 6. A special form of screen permitting luminous letters or numbers to be seen only in certain directions.

apart and fixed in front of the indicator lamps. The back plate is provided with holes, at the lamp centres, and the diameter of these holes can be varied, say, from $\frac{1}{8}$ in. to $\frac{3}{8}$ in. in diameter according to the length of the path over which visibility is required. The front plate is also drilled with holes, on the same centres, but slightly larger in diameter than those in the back plate, say 1-16 in. larger. The front plate should be adjustable in the vertical plane, and this enables the brightness of the lamps to be seen from the desired positions only. The brightness of any surface visible from above the horizontal is practically nil. This arrangement is shown in Fig. 9.

Shed Lighting.

Certain types of railway and dock sheds are allowed to have low orders of illumination without black-out on the windows or roof lights. Here care must be exercised to ensure that these lights are placed in such a position that vehicles with white roofs cannot be left stationary below them. In the same way the stacking of materials, goods, etc., may provide a large and well-illuminated surface below an unscreened roof light. Further, the natural dirt or grime on clear glass windows (vertical) turns them into a dispersive light source in much the same way as with frosted glass, so that the internal lights should be shielded sufficiently to prevent the direct light of the illuminant reaching the windows. Something of the same sort arises when using BS/ARP.37 fittings inside existing glass lanterns. The internal reflection on the glass can be reduced by applying the black-out paint on the inside instead of the outside of the glass.

Crane Lighting.

The most difficult problem of all the exempted lighting requirements is, perhaps, crane lighting. The problem should be regarded as similar to that of enabling a man driving a car at night to see objects on the roadway. Dash-board lights, or any lights which reflect from the inside of the wind screen, obscure the driver's vision. The same applies to the crane driver in his cab. Even resistance lamps, or ventilation holes in inclosing cases over resistance or indicator lamps, may cause serious distraction through reflection from the inner glass surface of the control cabin. Everything possible should be done to enable these drivers to remain dark adapted. Perhaps it is another of those instances where an issue of cod liver oil might be an advantage—if the drivers would take it.

There is little difficulty in illuminating the areas from which goods or other materials are "picked up" or unloaded "on to," but often the driver has to see his load when it is up in the air in order to clear obstructions such as guy ropes at masts on board ships or nearby buildings. This calls for a special fitting designed to produce a cone of light which only illuminates the crane hook or ball and the load at all levels from the quay level to the highest point of elevation of the load. The design of this fitting is influenced by the type of crane in use, as to whether it has a luffing and swivelling jib, and also by the speed of movement of the jib. The reflection of the light source on the water has also to be taken into consideration. Something of the same class of design is necessary where grabs are in use, and this particularly applies to the instances where double rope or chain grabs are employed. The driver has to be sure that the grab opening rope is not slackened too much since it may foul the groves on the rope drum.

The crane problem that has yet to be solved satisfactorily is the case when the crane driver's cabin is situated some distance below the crane hook or grab, and where such loads have to clear obstructions higher than the crane cab. If anybody can offer some solution to this subject it would be most useful.

White Lines.

The most important point in all A.R.P. lighting schemes is to arrange to provide the maximum contrast possible for the low orders of illumination available. Even without the use of whitened surfaces the average eye is capable of distinguishing the difference in brightness between the roadway and pavement on a dark night, so that the use of whitened areas improves this vision considerably. Stairs should be whitened for some four inches at each side of both the treads and the risers and for approximately six inches up each side as a skirting. Short flights of stairs, say three or four steps, should be replaced by a ramp. Obstructions and corners of buildings should have white patches up to about four feet in height. The use of whitened surfaces, on crane weights and hooks, grabs, around hoppers, on obstructions which have to be avoided when operating a crane, and as protective clothing on operatives who have to be seen by crane, locomotive, or lorry drivers, all provide improved vision facilities, and in this way reduce accidents. For instance, where the unloading of coal by grabs is employed the coal trimmers, in barges' or ships' holds, are provided with a 15-in. square of white American cloth, having a piece of tape fixed to each corner. By means of the tapes the white surface is tied and retained on the middle of the back and enables the crane driver to see the trimmers, and so avoid landing the grab on to them. American cloth is easily and quickly cleaned, thus maintaining the maximum contrast.

Maintenance.

In conclusion, it is necessary to ensure that A.R.P. lighting is maintained in its proper A.R.P. conditions. It is frequently found that little or no maintenance is given to some schemes after they have been installed, with the result that reflectors and fittings are twisted and turned in all directions, with the result that they may even contravene the Order.

The question of maintaining these exempted illuminated areas, up to the agreed conditions, is an important point in the country's war effort. It should, therefore, receive its proper share of attention.

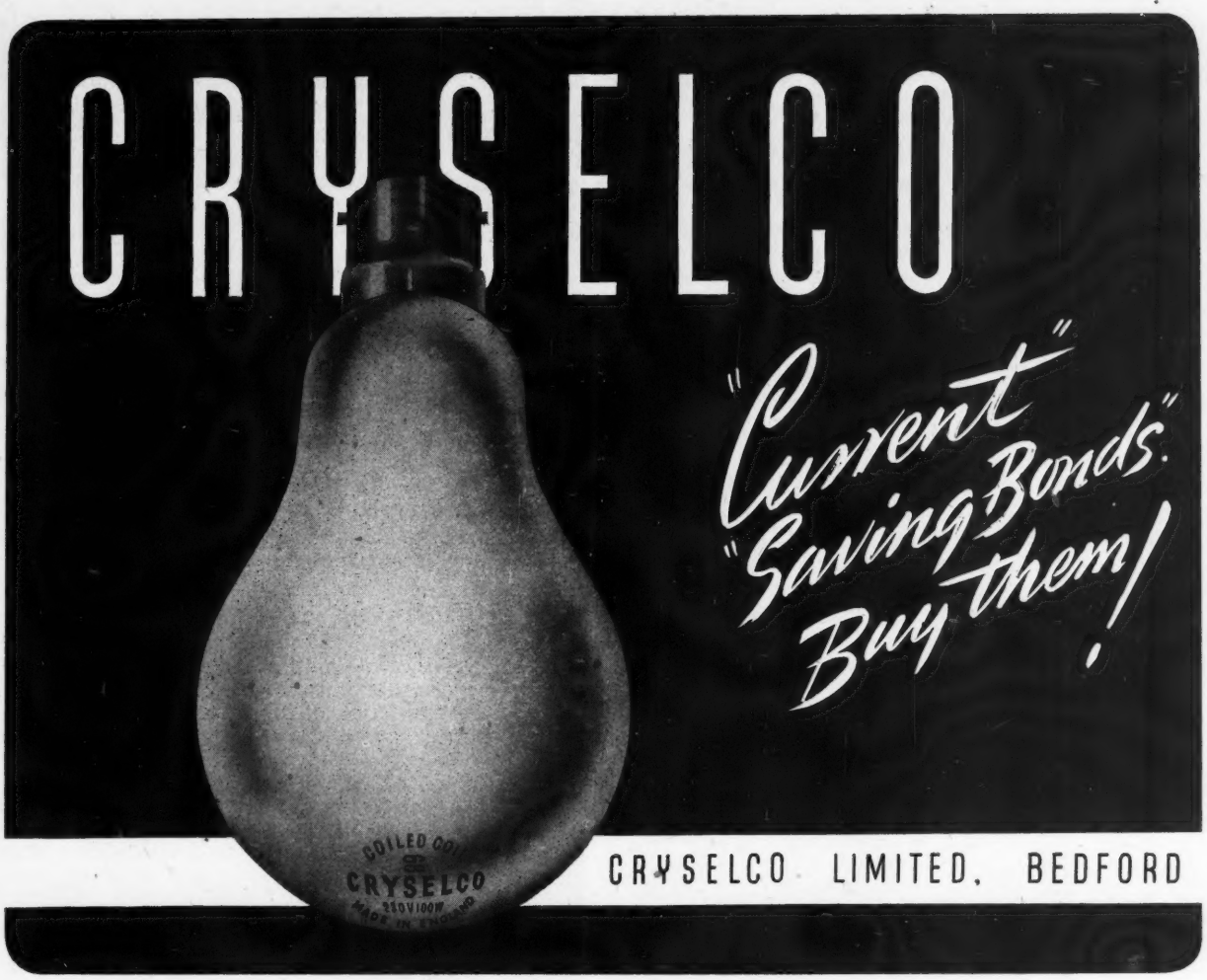
The author desires to acknowledge his indebtedness to the Chief Engineer, L.N.E.R., the General Electric Company, Ltd., and the Strand Electric Company, Ltd., for information, diagrams, apparatus, and photographs mentioned in his paper.

Post-war Reconstruction

As I.E.S. members are aware the Society is now actively studying the part to be played by lighting in reconstruction problems, and a number of committees have been appointed to deal with special aspects of the problem.

In the meantime other bodies have not been idle. A conference of various electrical organisations was held in the Lighting Service Bureau on September 3 under the chairmanship of Mr. C. A. Hughes, chairman of the E.L.M.A. Council. Plans for post-war reconstruction were discussed and it was agreed to set up a Committee of Representatives of the various organisations in the electrical industry to deal with aspects in which they are interested. One of the early tasks of this committee will be to survey the whole problem, possibly delegating the work to sub-committees, and to consider collaboration with the Reconstruction Committee of the Institution of Electrical Engineers.

It may be assumed that the I.E.S. Committee will be kept informed of developments such as these and will be prepared to co-operate with other bodies on subjects of mutual interest.



Photoelectric Photometry

By the invitation of the Physical Society members of the Illuminating Engineering Society were, on October 10, afforded an opportunity of hearing an interesting lecture by Professor J. T. MacGregor-Morris at the Imperial College of Science.

We hope to deal more fully in a subsequent issue with the lecture, which dealt with a new form of differential photoelectric photometer based on the rotation of a cell, or of two cells in opposition, between the two sources compared. Lt.-Col. Kenelm Edgcumbe and others complimented the author on the ingenuity of the apparatus and the experiments illustrating its high precision and great sensitiveness. It was estimated that correct readings to one part in a thousand could be obtained, and the device was evidently admirably designed to enable small fluctuations in candle-power to be examined.

An Art Gallery in Kingsway

Some little time ago we stressed the importance of making good use of areas of boarding necessitated by the destruction of display windows during air raids. There is no need for such monotonous blank spaces to be left unadorned, and the General Electric Company, Ltd., have shown what can be done in the case of their premises in Kingsway, the frontage windows of which suffered during one of the many air raids on London. The window apertures were, of course, boarded up, but the hoarding has since been used to publicise many Government propaganda schemes—the women's services, fire fighting and agriculture, etc., as well as the varied activities of the G.E.C.

The display has been regularly altered during the months that have elapsed since the original destruction. A complete change in design and type was recently effected, when the G.E.C. commissioned Lupton, the well-known artist, to supervise the preparation and erection of a complete group of new displays which have since attracted much

One of the striking pictorial efforts which adorn the front of Magnet House in Kingsway.

attention from the thousands of people in all walks of life who pass along Kingsway.

The picture here illustrated, "This England," is one of the most happy of these creations, and it is reported that within a few hours of the mounting of the displays numerous personal requests to buy the original were received.

"Whiteness"

The Colour Group discusses the Meaning and Measurement of Whiteness.

At a meeting of the Colour Group of the Physical Society, held at the Imperial College of Science on Wednesday, September 24, under the chairmanship of Dr. W. D. Wright, three papers on this subject were read by members connected with industries in which the appraisement of whiteness is a matter of vital importance.

Measuring Whiteness

Mr. J. G. Holmes, of Messrs. Chance Brothers and Co., Ltd., dealt with the nature and measurement of whiteness. He described the principles of trichromatic colorimetry, pointing out the unique character of white light which, actually, had equal energy per unit wave-length interval throughout the visible spectrum. He then dealt with the sensitivity of the eye to small departures from whiteness and mentioned the effect of change of illumination; more than 10 ft.c. should be provided when making visual tests of whiteness.

Colour, said Mr. Holmes, could be measured in three ways, viz., (a) by means of a colorimeter (additive or subtractive); (b) by abridged spectrophotometry (measurement of the relative spectral distribution, taking very large wave-length intervals so as to divide the visible spectrum into only a small number of parts); or (c) by full spectrophotometry. This last method, giving the complete spectral distribution curve, was the only one which provided complete information, but it was very laborious. All three methods could be carried out visually or by photoelectric apparatus. Winch had described a photoelectric instrument for abridged spectrophotometry, while in America the Hardy recording spectrophotometer was available for those interested in colour problems. It was unfortunate, said the speaker, that there was at present no such instrument in this country.

The Whiteness of Paper

The second paper was by Dr. V. G. W. Harrison, of the Printing and Allied Trades Research Association, whose subject was the measurement of "near-whites" in the paper industry. He said that most near-white papers had a spectral distribution curve corresponding to a yellowish white, and he showed curves of reflectance for a number of typical specimens, particularly various grades of newsprint, having reflection factors ranging from 50 to 80 per cent. In the paper trade the term "brightness" was used to denote the quality of the reflected light, estimated visually. Since with a near-white small changes of saturation could be more easily noticed than small changes in brightness (as usually defined), it followed that a paper dyed to correct the yellow tinge was often described as "whiter and brighter" than a similar paper undyed, although this latter had a higher reflection factor than the dyed specimen. In an actual test on twenty-eight papers eighteen observers out of twenty gave this verdict, and Dr. Harrison, therefore, proposed the use of a special term, such as "visual brightness," to denote this quality in the case of near-white papers. He had tried to correlate this "visual brightness" with some function of the reflectances in the red, green, and blue parts of the spectrum.

For the direct colour measurement of near-whites it had been found that the ordinary visual colorimeter with a small field was quite useless, as the differences to be measured were much too small and were largely swamped by personal errors. A really first-class photoelectric colorimeter might be satisfactory, but anything less than this was totally unsuitable. On the whole, since an expensive instrument was necessary in any case, it seemed best to go all the way and to use an accurate photoelectric spectrophotometer.

Dr. Harrison then suggested a possible way in which spectrophotometry might be widely adopted in the paper trade, even by those sections which lacked the trained staff or funds to set up a spectrophotometer of their own. He thought this might be achieved by standardising a limited number of colours and by setting up a central testing institution which could distribute periodically (e.g., monthly) to the various mills, specimens in which these colours were accurately reproduced and which had been checked by means of centralised measuring apparatus.

The Whiteness of Cinema Screens

As long as the pictures projected in cinemas were black and white or monotone, lack of whiteness in the screens used was quite unimportant, said Mr. C. G. Heys-Hallett, in introducing his paper "The Apparent Whiteness of Cinema Screens." The introduction of the colour film had, however, entirely altered the position and recent great improvements in the colour-rendering of films had made the colour of the light source used for projection and the colour of the screen itself matters of great importance.

Mr. Heys-Hallett exhibited a photoelectric reflectometer for measuring the brightness of a cinema screen as seen from the viewing window in the projector-room of a cinema. He had found that the average brightness of the screen in a large number of good cinemas was about 5 foot-lamberts. Colour he measured by placing red, green, and blue filters over the cell and the "norm," similarly determined by averaging the results for a number of cinemas, was a ratio red : green : blue=45 : 100 : 50 for the particular filters used.

The variation in the apparent colour of the screens in the cinemas of this country, said Mr. Heys-Hallett, was very great and more than sufficient to spoil colour films. This could be avoided by standardisation with suitable maximum permissible tolerances, although there were certain difficulties which would have to be overcome before standardisation could be achieved. Some colour films were shown at the conclusion of this paper in order to demonstrate the effects to which reference had been made, particularly the yellowing of a screen by ageing.

A Standard White Surface

During the discussion which followed the presentation of the papers several speakers referred to the use of magnesium oxide as a standard white surface. It was pointed out that in order to get a satisfactory white a layer of considerable thickness was required, and titanium dioxide was suggested as a more satisfactory material. On the other hand, it had been found that if the magnesium oxide was coated on a silver surface it was not necessary to increase the thickness of the coating above 1½ mm.

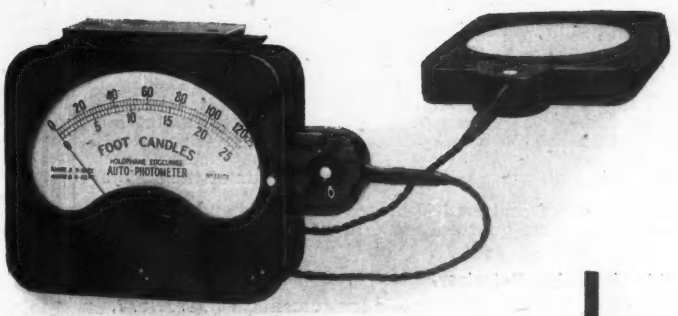
Mr. Donaldson (N.P.L.), while agreeing that for the measurement of near-whites the ordinary colorimeter was not satisfactory, said that with a large field and special desaturated (pale) primaries it was possible to get quite accurate results.

With regard to cinema screens, Mr. Applebee drew attention to the effect of the colour of the light scattered on to the screen from the auditorium, and Dr. Wright inquired whether films could be processed to compensate for screen coloration and, if so, whether it would be necessary to adopt the same standard of colour for screens in this country and in America.

Light Control and Efficiency

EVERETT EDGCUMBE make a complete range of Photometers for every kind of light measurement including A.R.P. lighting.

● Auto Photometer (Factory Act Pattern) for demonstrating the illumination in large and small spaces, to meet the lighting requirements of the Factories Act, 1937. The separate Autophotic Cell can be placed in any position, independent of the indicator. Double ranges of 3. and 30 foot-candles enable light measurements from .05 foot-candles upwards to be made.



Lower extended scales are a feature of Everett Edgcumbe Portable Photometers
Typical scale of Factory Act "Auto Photometer" (full size).

A.R.P. (VISUAL) PHOTOMETERS

● **THE A.R.P. PHOTOMETER** enables illumination at extremely low A.R.P. ("black-out") values to be directly measured.

● **THE A.R.P. ILLUMINATION GAUGE** complies with the latest B.S.I. (A.R.P.) Specification for Gauges for checking "black-out" illumination.

● **AUTO PHOTOMETER** for testing shielded car headlamps, scaled 0-5 foot candles, the figure of 2.5 foot candles specified by the Ministry of Home Security being at mid scale.

PHOTOMETRIC TERMS explained :—

Write for Leaflet 471.

EVERETT EDGCUMBE

COLINDALE WORKS, LONDON, N.W.9

Manufacturers of all kinds of indicating and recording instruments, and photometry experts.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 138, September, 1941)

I.—RADIATION AND GENERAL PHYSICS.

211. Optics of Atmospheric Haze.

E. O. Hulbert. J. Op. S. Amer., Vol. 31, No. 7, pp. 467-476, July, 1941.

The atmospheric attenuation coefficient β is calculated from a series of measurements of the apparent brightness b, of a black body in daylight at various ranges (L) up to 15 km., using $\beta = \frac{1}{d} \log \frac{1}{1-\frac{b}{L}}$. Measurements of the angular distribution of scattered light are also made and show that more than three-quarters of the light is scattered forwards.

A. E. S.

212. Molecular Polarizer.

Anon. Review of Scientific Instruments, Vol. 12, No. 7, July, 1941.

A new form of polariser has been developed, which uses the individual molecules of the material instead of crystals for polarising the light. It has a considerably higher transmission than other forms of polariser, and details are given of its manufacture. It is also almost free from colour.

W. E. H.

213. Refractometer for Liquids.

Anon. Review of Scientific Instruments, Vol. 12, No. 7, July, 1941.

A new form of simple refractometer is described. A small glass slide with a bevelled edge is mounted on a glass plate and a drop of the liquid to be measured is placed in the space between the bevelled edge and the glass plate. The deviation of a beam of light passing through the prism edge and the liquid is indicated by a virtual image of a fixed aperture projected on an illuminated scale, calibrated to read the index of the liquid directly. W. E. H.

214. Emission Spectroscopy in the Investigation of Problems in Ceramics.

H. C. Harrison, L. B. Bassett. Journal of the American Ceramic Society, Vol. 24, No. 7.

The fundamental theories of emission spectroscopy and their application to qualitative and quantitative spectrographic analysis for glasses are reviewed. W. E. H.

215. Determination of the Opacity of Glasses to the Near-Ultra Violet.

W. R. Lester. The Glass Industry, Vol. 22, No. 7. July, 1941.

In order to determine the transmission of glasses to the near-ultra violet, the author has made use of the fluorescence of quinine sulphate solution produced by this radiation. The method lends itself to rapid determinations, which is of particular value in commercial work. W. E. H.

IV.—LIGHTING EQUIPMENT.

216. Colours of Ceramic Tiles.

Parry Moon. J. Op. Soc. Amer., Vol. 31, No. 7, pp. 482-487, July, 1941.

Spectrophotometric data, and reflection factors are given for tiles of various colours. A. E. S.

217. Plastics for Optical Lenses.

Anon. British Plastics, Vol. 13, No. 147, August, 1941.

The suitability of various plastics for optical lenses is discussed and methods of manufacture described. Lenses have been made with transmissions of 95 per cent. and refractive indices varying from 1.5 to 1.6. W. E. H.

218. Phosphates in Opal Glasses.

W. A. Weyl. Journal of the American Ceramic Society, Vol. 24, No. 7.

The theory of the opacity of bone-ash opal glasses is discussed and the importance of phosphate opacification for opal glasses resistant to heat shock is emphasised.

W. E. H.

YES A POWERFUL ROBUST SELF-SUSTAINING WINCH

Hundreds of thousands supplied during the last 35 years to Govt. Depts., Corporations, Railways, innumerable traders, etc., etc. Will not run back. No wheels to get caught in. Direct Drive and Ratio Type

WINCHES

Smallest wall space: side or front driving, also special types including multi-division barrels, combined horizontal and vertical operation, etc.

The London Electric Firm Gordon

Phone: Uplands 4871/2 (2 lines)

NO RATCHETS, PAWLS, SPRINGS, or GEAR WHEELS

219. Stroboscopic Method Checks Cloth Printing.

Anon. El. World, 115, p 2,232, June 28, 1941.

A device is described by means of which material printed in colours and moving rapidly (up to nearly 500 yards per minute) can be inspected, so that faults can be detected rapidly and spoilage reduced to a minimum. Standard fluorescent (tubular) lamps are flashed to high brilliancy in synchronisation with the movement of the material, the resulting stroboscopic effect giving clear vision of the pattern. S. S. B.

220. Asbestos Covered Cables.

W. Lethersich. Elect. 127, pp. 87-88, August 15, 1941.

The high temperatures attained by rubber insulated flexible leads on office, factory, and domestic pendant fittings has lead to the consideration of asbestos-covered cables for this purpose. Results of tests on insulation resistance and electric strength both of asbestos-covered and also varnished cambric flexibles are given. C. A M.

221. Reflection as an Aid to Lighting.

R. R. Hoare. Elect. 127, p. 93, August 15, 1941.

The author has developed an improved method of concentration of light from a lamp with a spherical back reflector and auxiliary side reflectors housed within the glass envelope. C. A. M

V.—APPLICATIONS OF LIGHT.

222. Phosphoresecence and its Applications.

J. N. Bowtell, E. E Miles. G.E.C. Journal XI., No. 4, p.p. 256-265, August, 1941.

The mechanism of phosphorescence and luminescence is discussed in detail, together with the practical application of phosphorescent paint and painting processes. Suitable sources of long-wave ultra-violet radiation are described.

C. A. M.

223. 36,524 Fluorescents in Aircraft Plant.

Anon. El. World 116, p. 85, July 12, 1941.

An aircraft factory in U.S.A. has been lighted throughout by tubular fluorescent lamps. In the engineering and administration buildings an illumination of 35 ft.c. is provided, while in the assembly area 45 ft.c. is claimed, with mounting heigths of 35-42 ft. A total of 36,524 tubular fluorescent lamps (40-watt) rating) is used. S. S B.

224. Fluorescent Lighting in War-time Industry.

Anon. Signs, Vol. 14, No. 12, p. 254, September, 1941.

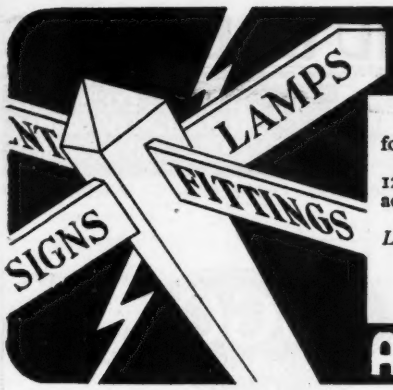
Reference is made to the rapid development of fluorescent lighting in the U.S.A. and to industrial developments in this country. Examples of processes for which this mode of lighting is specially suited are quoted and illustrations are presented showing the application of fluorescent lighting in factories devoted to intricate processes such as those in making hosiery and ball bearings, etc.

225. Infra-red Bank Doubles Drying Speed.

A. J. Du Pont. El. World 115, p. 2,244, June 28, 1941.

Details are given of an installation of radiant heating lamps used for drying the finishing coat on fibre board. The speed of drying was nearly double that of the previous steam-heated oven, while the oven space was much smaller.

S. S B.



WHERE TO BUY

We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3¼ inches wide) are given below.

These terms are equivalent to half our ordinary advertising rates, but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *Light and Lighting* during the period of the contract.

Terms:	12 Successive Monthly Insertions	£3 10 0	}	Payable
	24 " " "	£6 0 0	}	in
	36 " " "	£8 10 0	}	Advance

A DIRECTORY OF LIGHTING EQUIPMENT

1

PHOTOMETER BENCHES Cubes, Spheres, Heads, Standards of Light, Special Accessories

Makers to principal research and technical bodies, lamp manufacturers and educational establishments.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER, S.W.1

2

ALLOM BROTHERS LTD.
LOMBARD ROAD, MORDEN ROAD, S.W.19.
Lighting Specialists
Decorative Fittings. Industrial Fittings
Sheet Metal Work.

3

Take no risks— specify **BENJAMIN PLANNED LIGHTING**
THE BENJAMIN ELECTRIC, Ltd., TARIFF ROAD, N.17

4

LIGHT-CONDITION your industrial plant with:— **MAZDA** LAMPS in MAZDALUX Reflectors.
THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, ALDWYCH, W.C.2

5

THE REINFORCED CONCRETE LAMP COLUMN SPECIALISTS
CONCRETE UTILITIES, Ltd., WARE, Herts.
Enquire for details of "Aids to Movement" in concrete.

6

DRAKE & GORHAM LTD.
36, GROSVENOR GARDENS, LONDON, S.W.1
and Branches
Specialists in Factory Lighting and in all problems Relating to the Requirements of the New Factory Act

7

Metal SPINNING, SHEET-METAL WORK PRESS WORK, WELDING
Vitreous Enamelling *Brass Foundry, and Machining.*
ELM WORKS Ltd. SUMMERSTOWN, S.W.17 EST. 1903

8

FITTINGS **ELECO** FOR EVERY INDUSTRIAL REQUIREMENT
ENGINEERING & LIGHTING EQUIPMENT CO. LTD
SPHERE WORKS ST. ALBANS HERTS. TELE. 2258/9

9

EEL REGISTERED **THE SELENIUM PHOTO-CELL**
ARTHUR E. EVANS & CO., LTD. BISHOP'S STORTFORD, HERTS

10

PHOTOMETERS
PHOTO-ELECTRIC
BENCH, CUBE, STREET and PORTABLE TYPES
FOR CANDLE-POWER AND ILLUMINATION TESTS
EVERETT EDGCUMBE Colindale Works LONDON, N.W.9

11

THE GUNFIRE (Trade Mark) **PIONEERS of AUTOMATIC LIGHTING**
GAS CONTROLLERS, ELECTRIC, and SYNCHRONOUS TIME SWITCHES
Manufactured by:—
BRITISH, FOREIGN AND COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD., BOURNEMOUTH

12

SCIENTIFIC Holophane TRADE MARK ILLUMINATION
The Hall-Mark of Good Lighting

13

NEWBRIDGE
After the war we hope to serve public lighting engineers by producing even better NEWBRIDGE gas controllers and Comets and H.B.E. electric time switches than in the past.
'Grams: Horstmann, Bath THE HORSTMANN GEAR CO., LTD., NEWBRIDGE WORKS, BATH, SOMERSET 'Phone: 7241/2

14

C. H. KEMPTON & Co. LTD., FOR MODERN STREET LIGHTING BY GAS
70-72, BENNERLEY ROAD, S.W.11

15
LIGHT and **LIGHTING** by **LINOLITE**

16
MECHANICAL M-C **COMPONENTS**
BRITANNIA WORKS TOLLINGTON PLACE, N.4.
SPINNINGS IN ALL METALS / SHEET-METAL AND PRESS WORK / WELDED, BRAZED AND SOLDERED ASSEMBLIES / POLISHING AND SPRAY FINISHING
Tel.: ARCHWAY 4714 P.B.Ex.

17

MEK-ELEK Engineering Ltd.,
17, Western Road, Mitcham, Surrey
MITcham 3072. Cables: Mekelek, London

18
F. H. PRIDE LTD.
ILLUMINATING ENGINEERS
CINEMA & HOTEL LIGHTING SPECIALISTS
Designers and Manufacturers of Modern Lighting Fitments and Electrical apparatus
69-81, CLAPHAM HIGH ST., S.W.4 Telephone: MACaulay 2281/4.

19
LIGHT RAY APPARATUS
Control of Street, Factory and Sign Lighting.
Smoke Indicator and Recorder.
Automatic Fuel Feed Control.
RADIOVISOR PARENT LIMITED,
Stanhope Street, London, N.W.1.
'Phone: EUSton 5905/6.

20
REGD. TRADE MARK
NIPHAN
PLUGS, SOCKETS, TEES, COUPLINGS, TERMINAL-SOCKETS AND JOINT BOXES
for every portable and temporary lighting requirement
SIMMONDS & STOKES LTD.
VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1
Phones: (Head Office) Holborn 8637 & 2163

21
ELECTRIC LAMPS of all types
"SIERAY" ELECTRIC DISCHARGE LAMPS
ELECTRIC LIGHT FITTINGS
SIEMENS
STORE & INDUSTRIAL LIGHTING EQUIPMENT
CINEMA LIGHTING, etc.
38-39, UPPER THAMES STREET, LONDON, E.C.4

22
WASK
PATENT SELF SUSTAINING
WINCHES
FOR ALL PURPOSES
Quick hoisting with little effort
MADE IN TWO SIZES
Walter Slingsby & Co. Ltd., Keighley
Tel.: Keighley 3749 (2 lines)

23
STRAND ELECTRIC
AND ENGINEERING Co.LTD.
SPECIALISTS IN COLOUR LIGHTING and STAGE EQUIPMENT
LIGHTING FOR EVERY OCCASION
THEATRES·EXHIBITIONS
FLOODLIGHTING·CINEMAS
BALLROOMS·PAGEANTS
19-24 FLORAL ST. LONDON.W.C.2

24
For every type of GAS LIGHTING
SUGG WESTMINSTER
When you want the best!
CHAPTER ST., S.W.1

25

"THORLUX"
"OVERLAMP" REFLECTORS.
DISCHARGE or GASFILLED LAMPS
SLIP-IT-ON—SLIP-IT-OFF-OVER THE LAMP FOR CLEANING
F.W.THORPE LTD. WELBY ROAD HALL GREEN BIRMINGHAM.28.
FOR EASY MAINTENANCE THE BEST

26
WARDLE ENGINEERING Co., Ltd.
OLD TRAFFORD, MANCHESTER, 16.
PRISMALUX DIRECTIONAL LIGHTING UNITS
for stairways, corridors and doorways
Also for A.R.P. Shelters and tunnels.

INDEX TO "WHERE TO BUY"

Accessories	20
Architectural Lighting	6, 15, 21, 23
Automatic Light Control	11, 14, 19
Cinema Lighting	6, 12, 18, 21, 23
Concrete Pillars, etc.	5
Electric Lamps	4, 21
Enamelling	7
Fittings	2, 3, 4, 8, 12, 15, 17, 18, 21, 23, 24, 25, 26
Floodlighting	2, 4, 8, 12, 21, 23
Gaslighting	14, 24
Glassware	12
Industrial Lighting	2, 3, 4, 6, 7, 8, 17, 21, 26
Local Lighting	17
Mechanical Components	16
Photo Electric Cells	9, 19
Photometers	1, 10
Reflectors	3, 4, 8, 12, 21, 23, 25
Sheet Metal Work	2, 7
Signal Lights	26
Special Lighting	2, 6, 8, 12, 15, 18, 21, 23, 26
Street Lighting Units	4, 8, 12, 15, 21, 24
Theatre Lighting	2, 21, 23
Time Switches	11, 13
Winches and Suspension Gear	22

N.B.—The numbers are those attached to individual entries in the Directory *(See pp. 155—156)*

New BS/ARP 16 Fitting

We illustrate herewith a useful type of fitting introduced by the General Electric Company, Ltd., to comply with the revised issue (dated February, 1941) of BS/ARP 16, which specifies fittings to provide 0.002 ft.c. for outdoor use in approved circumstances, during the black-out. It will be recalled that the original specification related to fittings with a spacing ratio of 4 : 1. The design now illustrated is suitable for a ratio of 2 : 1, as contemplated in the revised specification. The fitting is weatherproof and can be adapted for use at heights of ten, fifteen, or twenty feet.